



Fort Detrick and National Interagency Confederation for Biological Research (NICBR)

Walter Reed Army Institute of Research

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The Importance of Program Evaluation

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Facing Unique Challenges

Future Shortage of U.S. Scientists and Engineers Will Limit Our Technological Future

- Local – Too few new science Ph.D.s holding U.S. citizenship – required by USAMRMC for security clearance and work in BSL 3-4 laboratories.
- Global – The World is Flat (Thomas L. Friedman) – Economic competition is global and U.S. deficits will be “filled” by surpluses elsewhere in the world. The U.S. will be part of fewer future global solutions.





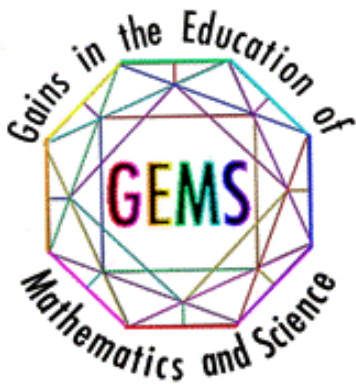
Local Initiatives to Train the Next Generation of Scientists

Focus On All Levels of Education

- Gains in the Education of Mathematics and Science (GEMS) at WRAIR and USAMRIID (3 other sites in MD, AL, MT)
- Science and Engineering Apprentice Program (SEAP) at WRAIR and USAMRICD (National Program)
- College Qualified Leaders (CQL – only WRAIR)
- Post-doctoral Fellowships at all USAMRMC Laboratories



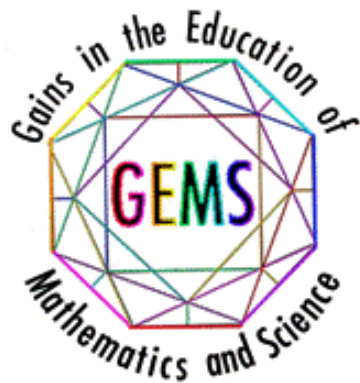
Funding the Critical Educational Programs



- GEMS has been supported by NIH (Science Education Partnership Awards) and now through the Army Educational Outreach Program (AEOP) and the USAMRMC.
- SEAP administration is funded through the AEOP with management by the USAMRMC (George Washington University holds contract). Stipends are paid by mentors!
- CQL is supported entirely by individual laboratories utilizing their own RDTE funds.



Impact of Educational Programs



- GEMS is a program methodology to reach as many of the youngest students as possible -- most enthusiastic, generally under-represented in the sciences and attending the most under-privileged schools (likely to expand the science/engineering workforce).
- SEAP is an excellence internship program – a place for highly successful GEMS to go (uncommon) but mostly local, highly talented student participants. “Serves the served” not the underserved and unlikely to expand the pool of scientists and engineers – status quo (many such programs nationwide).
Exceptions
- CQL – College level program where many GEMS and SEAP continue. Program is especially beneficial to the laboratory scientist.





History of Programs

- SEAP is 26 years old (1980, Executive Director, Dr. Marilyn Krupsaw at GWU, Jett/Yourick direction at WRAIR since 1991/92) – program evaluation has been retrospective and incomplete.
- SEAP CQL is 13 years old; program evaluation began with STARS/GEMS evaluations.
- STARS/GEMS is 12 years old (1995, developed by Jett/Yourick, funded by NIH/NCRR in 2000) – rudimentary evaluation from the earliest programs (formative assessments, early surveys, inclusion of hierarchical research staff to evaluate and participate).





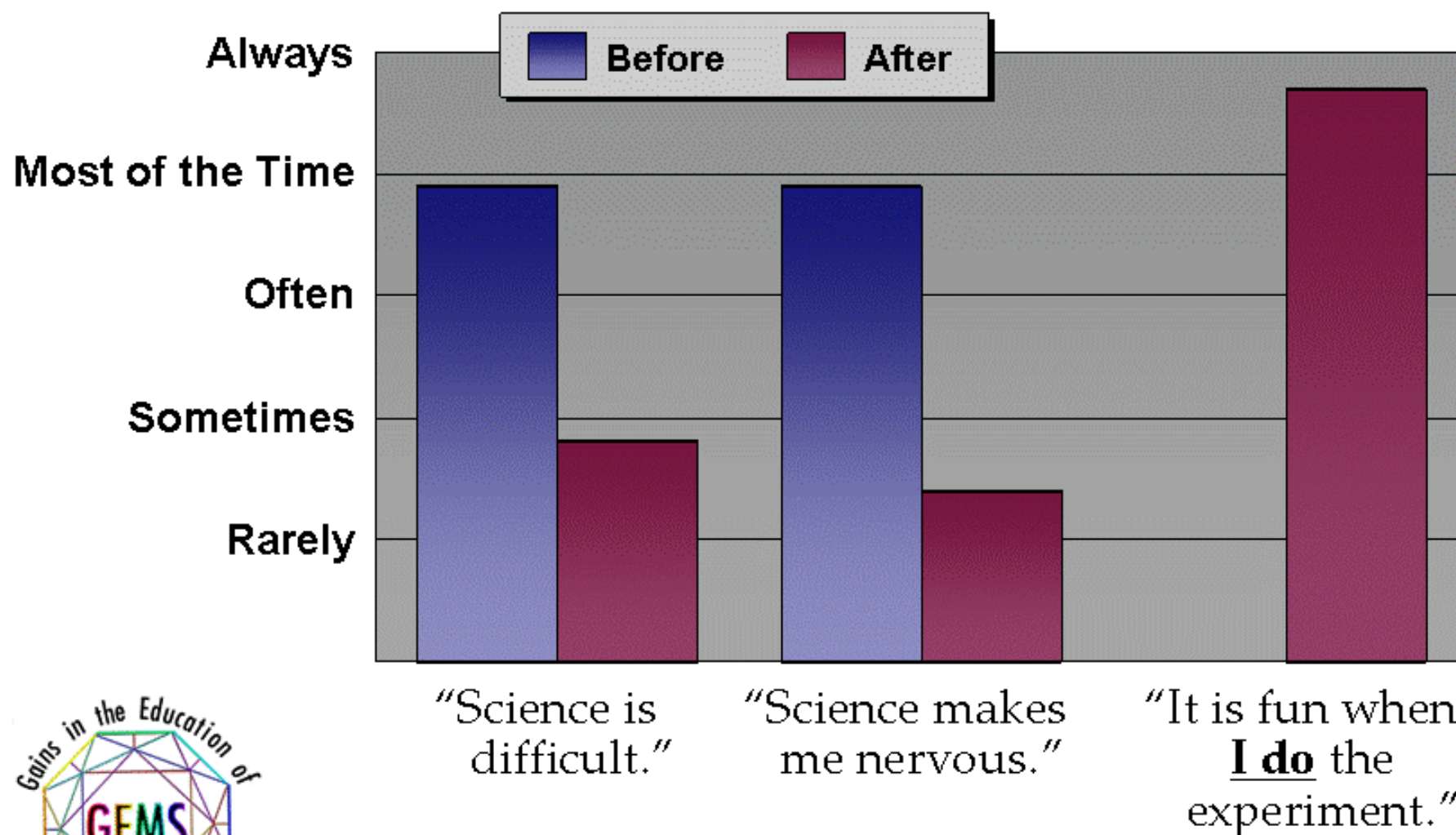
Program Evaluation 101

- How can we make positive statements about our programs?
 - Evaluation of student progression through programs over a period of 10-12 years.
 - Attitudinal pre- and post-surveys to support the value of program process.
 - Surveys for mentors, near-peer mentors, participants in GEMS, SEAP and SEAP CQL (not every year and not always every participant).
 - Formative and summative utilization of pre- and post-surveys – guide use of modules and lectures (formats for learning) during the summer and across years, evaluate near-peer mentors, inform as to value of teacher inclusion in the GEMS laboratory and educate us as to where students have learned specific skills.





Feedback Before and After GEMS Internships (149 Students)






Prog. Eval. 101 cont.

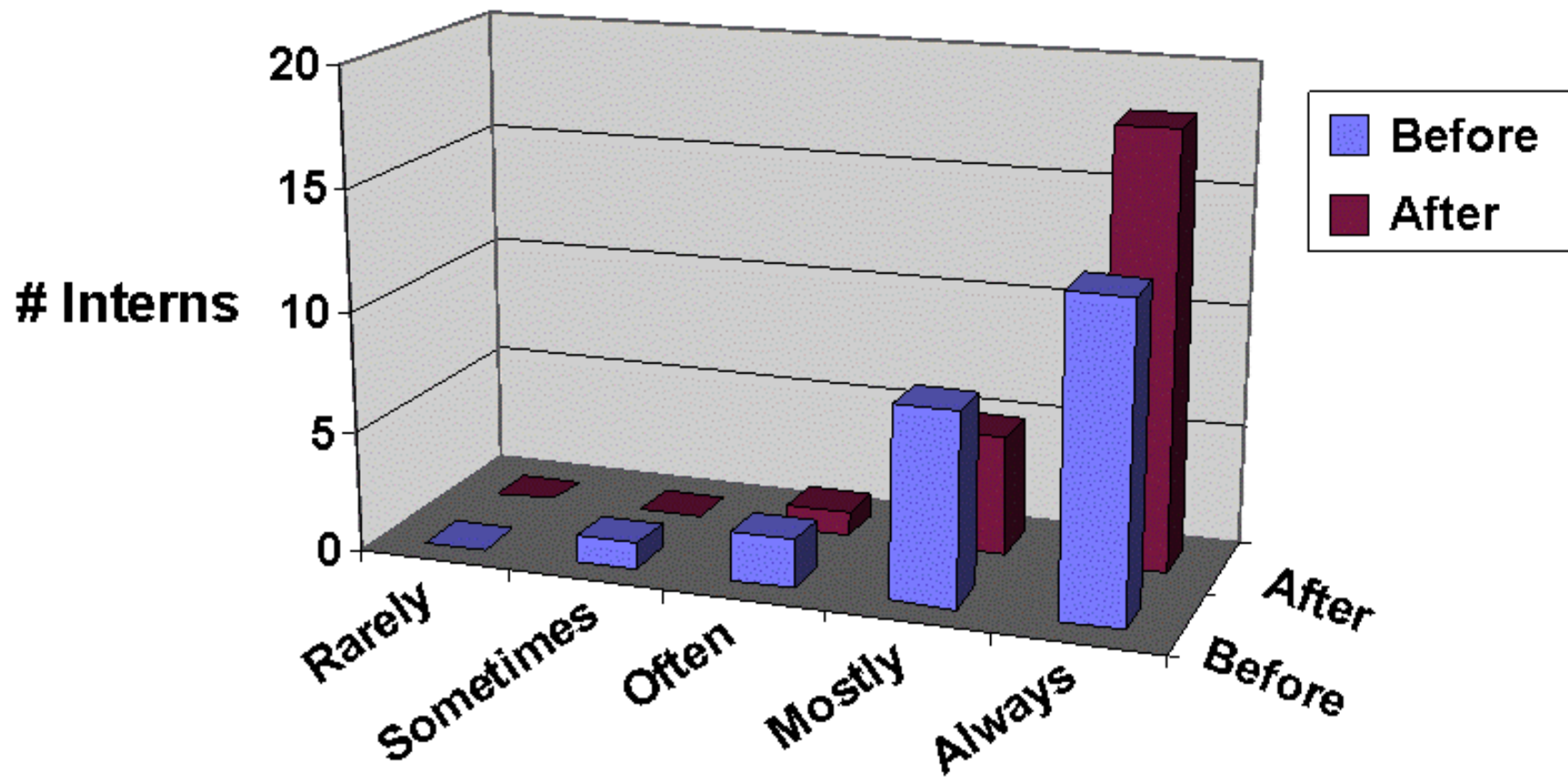
Instruments of Evaluation

- **Attitudinal Pre- and post-surveys** for participants were developed and utilized in 2000 and continue to be used and redeveloped by clinical/research psychologists and scientific staff.
- **Exit interviews** with near-peer mentors (about their experience and rating of continuing GEMS participants), SEAP participants and GEMS.
- **“Brag” letter** – 600-1000 letters sent to parents to determine program impact, change in children’s attitudes toward all learning and current educational status of participants.
- For 2005, **age/gender matching of program participants** with those students invited to participate but unable to do so due to schedule conflicts (must include all reasons – jobs, vacations and other educational opportunities) – best method of determining program impact. Should not ordinarily be done historically. Requires novel survey development.
- **Education Partnership Agreements** (or equivalent) with impacted educational system and **human use protocol** (IRB, HSRRB, HURC) allow for use of GPA, course selection, standardized test scores etc. (under human subjects protections with **de-identified/coded or anonymous data**) to be compared for participating and nonparticipating age- and gender-matched students.
- **Program Comparison** – SEPA Directors’ Meetings and site visits by other SEPA programs (program officials from University of Wisconsin, Arizona and others), visits to program sites (ARL, Slesesh-Kootenai College, MT), exchange of site visits with directors of Step-Up (University of Ulster, Northern Ireland, visits with schools).
- **Content-based pre- and post-surveys** for participants when specific, finite material can be learned. Can be based on standardized testing but very difficult to do. Material World Modules used this approach at Garrett College and their program processes, investigators and instruments were approved under WRAIR’s educational human use protocol.





Self-confidence: *I can make a meaningful contribution through my abilities and efforts*



N=24 GEMS Interns Level 3



Why evaluate?

- Provides more than anecdotal evidence or example. No assumption of value but rather evaluation provides evidence of change.
- Program improvement and advancement – formative and summative utilization
- Have an answer for NIH, DoD/Army, parents, schools, other program directors when they ask “Does it really make a difference?”, “Will it benefit our students or serve our needs?”, “Is it a valuable use of in-school time?”.
- Evidence for current and future funding – NSF, NAS, NIH, DoD/Army, non-profit organizations (Gates Foundation, HHMI), business/industry (specific skills needed). Percentage of funds on many grants must be used for program evaluation. Pilot data is critical to increase probability of funding.
- Expansion to new sites, locales – rural vs. suburban vs. urban (Where has it worked? Where will it work?)
- It is not scrutiny but rather opportunity to reveal the value of a program.
- Must not lose important data – implement as soon as possible.





Evidence for Funding!

- Providing input for Academic Competitiveness Council (President Bush through his January 2006 State of the Union Address and his Academic Competitiveness Initiative)
- DoD and NIH requests for program evaluation data (Starbase and GEMS responding for DoD and all mature SEPA programs and others responding with data/complete program information for NIH)
- Most dire consequence -- Without proof of educational efficacy through rigorous program evaluations (Randomized Clinical Trials; Accountability or testing being one of the pillars of No Child Left Behind), funding for DoD and NIH educational programs may be reallocated to Department of Education through Office of Management and Budget actions.

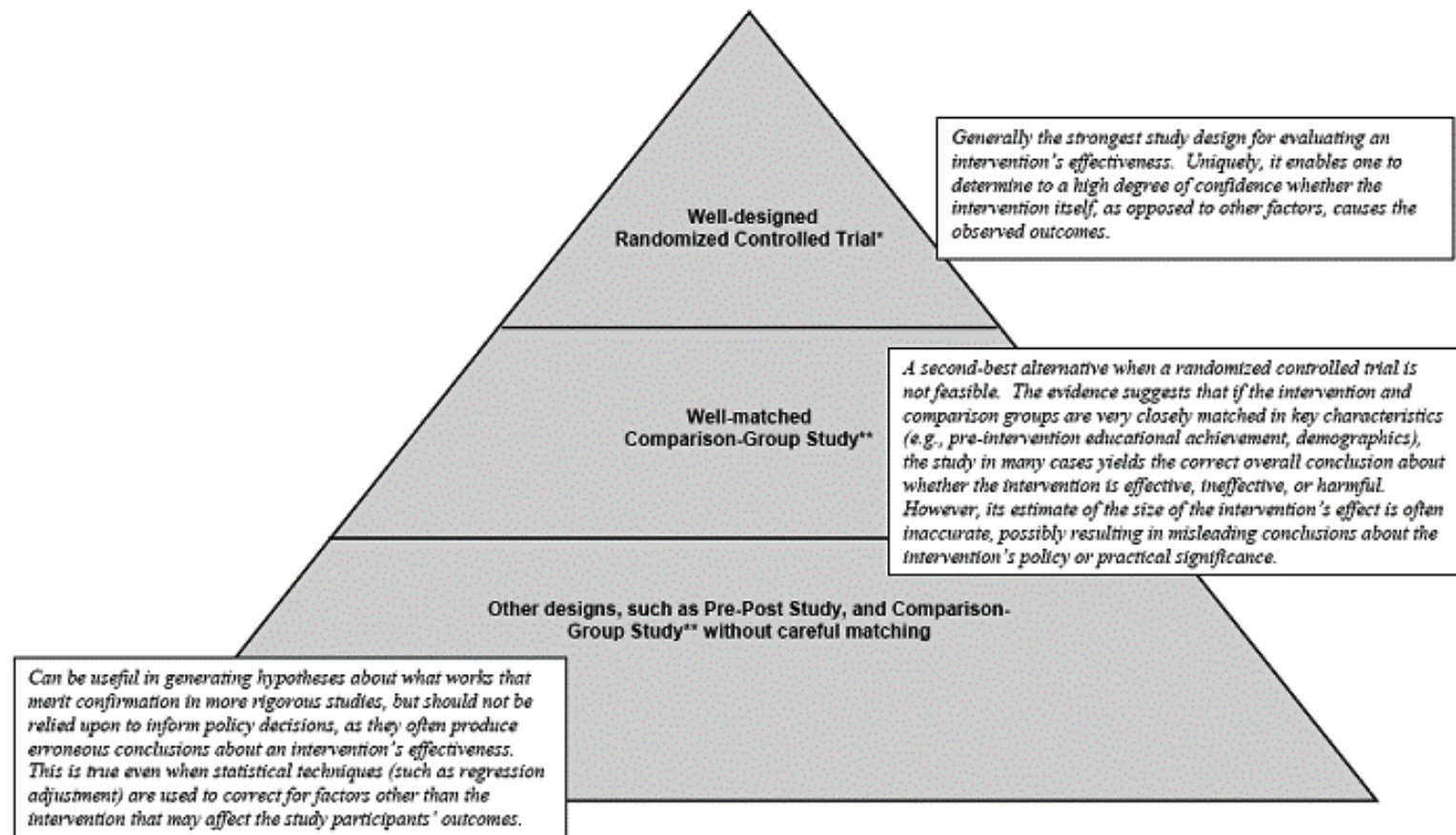


Academic Competitiveness Council

Hierarchy of Study Designs – Rigorous Evaluation

Graphic Summary:

Hierarchy of Study Designs For Evaluating the Effectiveness of a STEM Educational Intervention



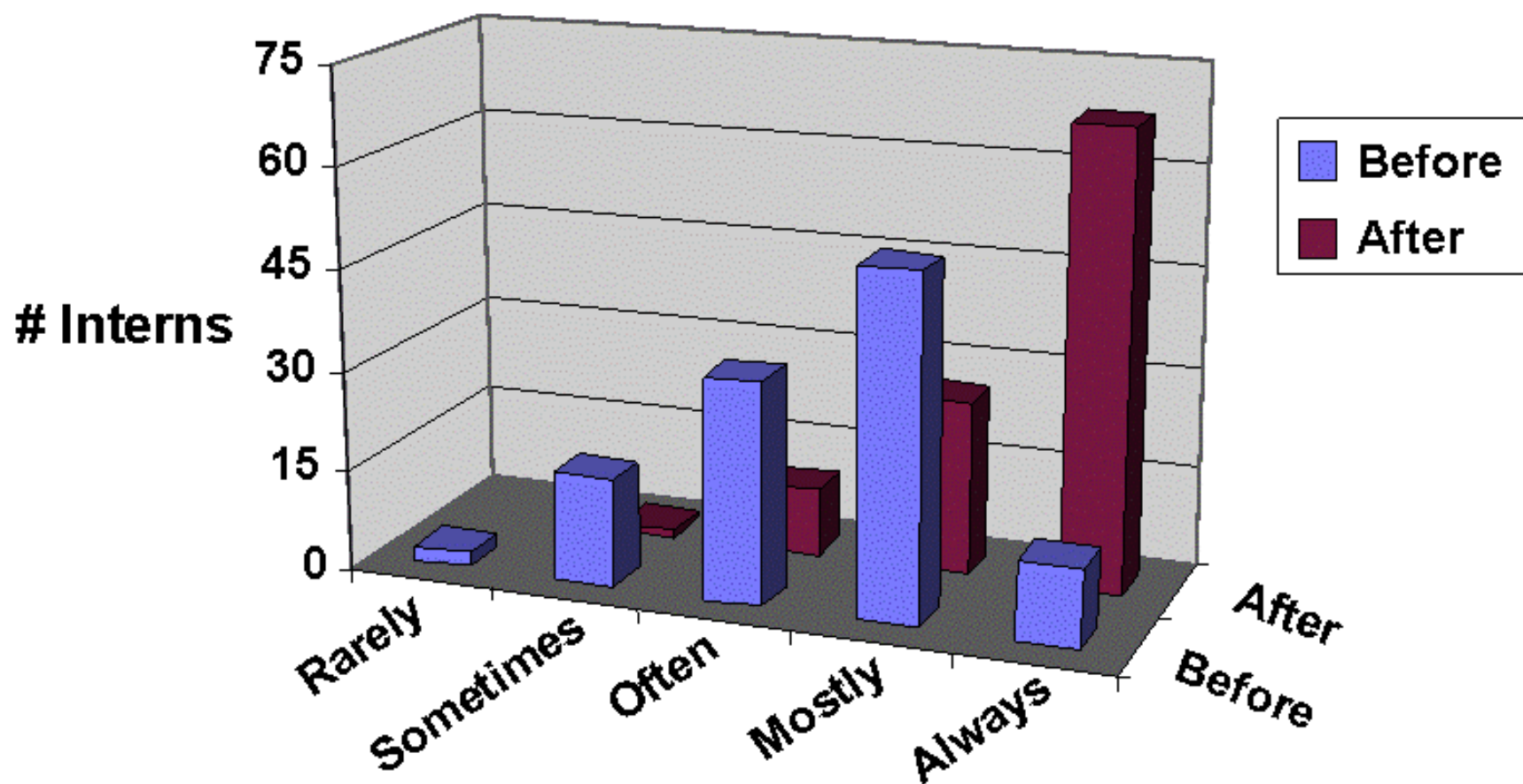
* A randomized controlled trial is sometimes called an "experimental" study.

** A comparison-group study is sometimes called a "quasi-experimental" study.





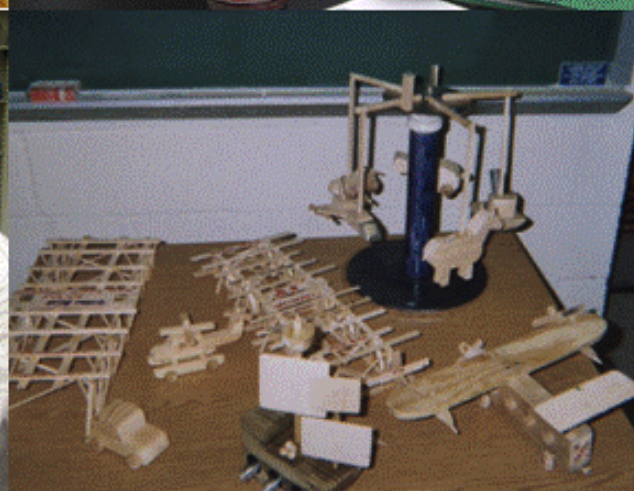
Self-Confidence Relating to Tasks in Science



N=102 GEMS Interns Levels 1-2



GEMS





Questions and Acknowledgements

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- Many, many D.C. City-wide Science Fair judges

